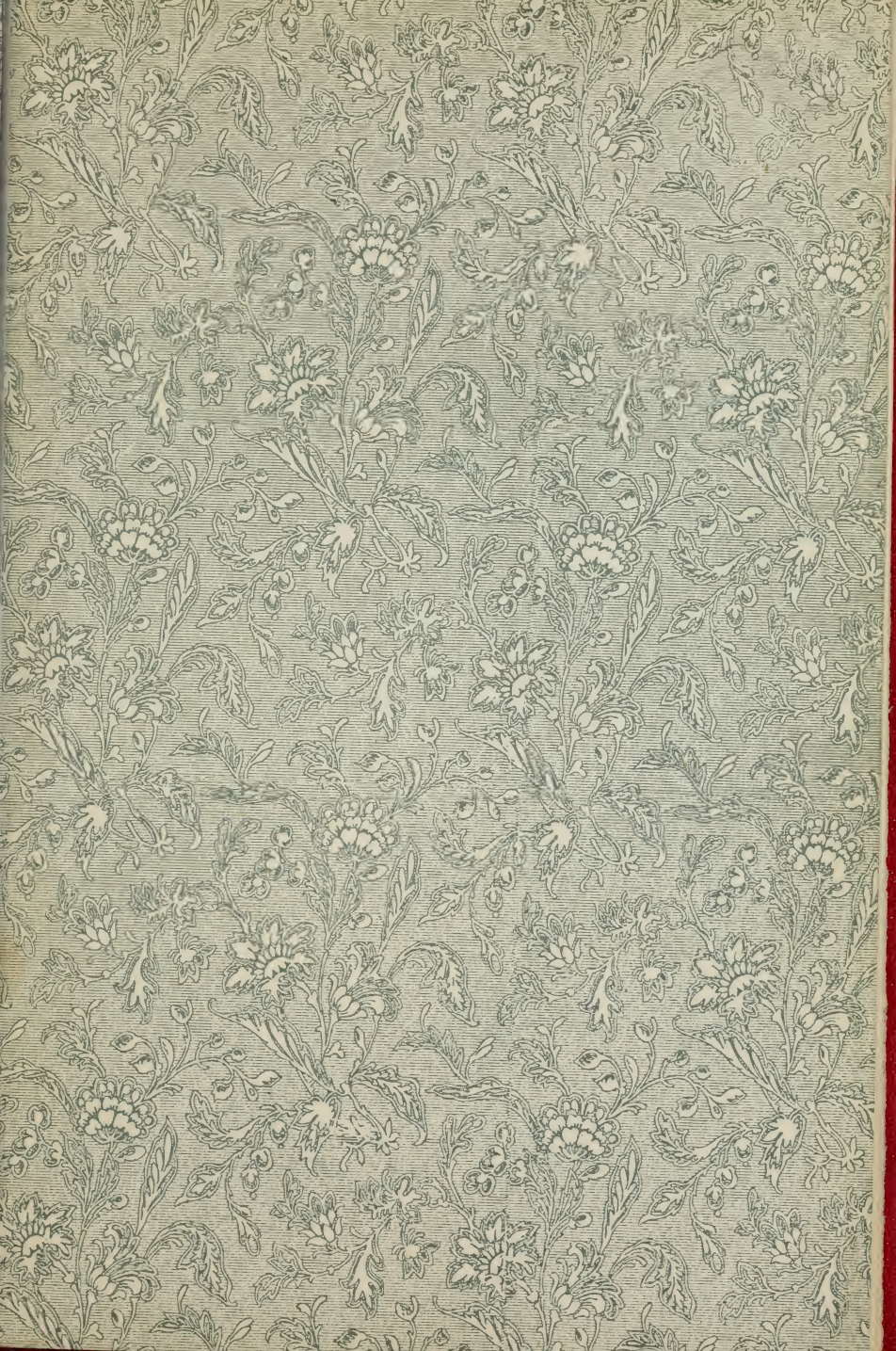


The book cover is made of dark red leather with blind-tooled decorative elements. At the top, there is a horizontal band with a central floral motif. Below this, a large oval frame contains the title. The central part of the cover features a large, arched frame. Inside the arch, there is a horizontal band with the series name, and below it, a large, ornate floral medallion. The entire cover is framed by a double-line border with small square motifs at the corners.

ZINCOGRAPHY.

WYMAN'S TECHNICAL SERIES





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ZINCOGRAPHY

A PRACTICAL GUIDE TO THE ART AS
PRACTISED IN CONNEXION WITH

Letterpress Printing.

BY

JOSEF BÖCK,

*Author of Technical and Historical Works relating
to the Graphic Arts; and Editor of the
"Gutenberg Book."*

REVISED AND ENLARGED EDITION.

TRANSLATED BY E. MENKEN.

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PREFACE.

HAVING at one time practised this branch of the Arts of Illustration, I was induced to write the present treatise for the "Illustrated Encyclopædia of the Graphic Arts," a most useful German work of reference, published by Herr Alexander Waldow, Leipsic, and in its compilation I have been assisted by men of practical experience and by the best authorities.

The work has been written with special regard to the requirements of the inexperienced. I have endeavoured to deal with the whole field of Zinc-etching as related to Printing, in order to stimulate the Zinco-typographer by pointing out to him the many-sidedness of his calling, so that he may be induced to take an interest in every branch of the subject.

What has been already attained by the art of

Zinco-typography is of such importance, and of so varied a nature, that it is as a matter of course only possible to give here a general survey ; such a survey is, however, of great practical value to the tyro in the art, since it will prove the means of inducing him to give further study to the subject. Devotion to his calling will prove an equal stimulus in the same direction.

Let me say, in conclusion, that most of the materials required for etching on zinc can be obtained ready prepared, both inexpensive and of good quality, and it is consequently unadvisable, in the majority of cases, to take the trouble of making them for oneself.

For the English edition the original work has been revised throughout, and considerably enlarged by me, and it is by special arrangement between myself and Messrs. Wyman & Sons, that the present authorised translation is issued.

JOSEF BÖCK.

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A PRACTICAL GUIDE
TO THE
ART OF ZINCO-TYPOGRAPHY.

CHAPTER I.

WORKSHOP AND PLANT.

BEFORE entering upon the subject of the requirements suitable for a zincographic *atelier*, it may be pointed out that the workshop itself should possess the means of being well ventilated, since, during the etching process, acid vapours are developed which are highly detrimental to health; unless carried away by suitable ventilation.

We will commence by enumerating the several articles that constitute the working plant:—

Etching-box.—This is in the form of an ordinary trough with sloping sides. It should be of about the following dimensions:—The length at the top should be 3 ft. 6 in., and at the bottom 3 feet.

The width at the top should be 2 ft. 6 in., and at the bottom 2 feet; and the depth should be 16

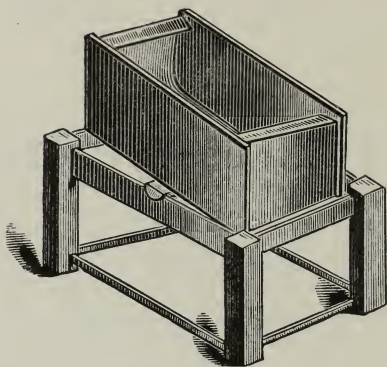


FIG. 1.

inches. The interior should be coated with pitch, in order to be able to resist the acid. The bottom joints must be covered with an extra layer of pitch,

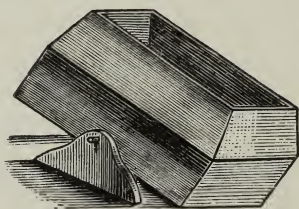


FIG. 2.

so as to form a less abrupt angle between the bottom and sides, in order to guard against the

inner coating being removed from the joints, which may happen as the result of the rocking motion.

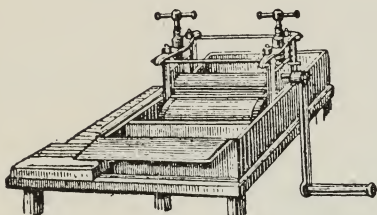


FIG. 3.

given to the plate. The etching-box is mounted on a wooden frame. In the centre of the under side of the box, and resting on the top of the frame,

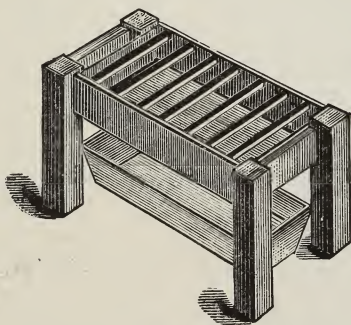


FIG. 4.

should be fixed a strong cross-piece, as shown in Fig. 1, so that the box may be easily rocked. For

small work, portable etching-boxes of smaller size may be employed, which can be placed on a table, the rocking arrangement being provided for as in Fig. 2.

Transfer or Autographic Press.—This consists of two small iron rollers mounted on a frame, between

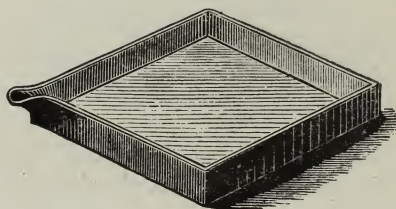


FIG. 5.

which the zinc plate is passed by the aid of a handle at the side, as shown in Fig. 3. The amount of pressure can be regulated by means of adjusting screws.

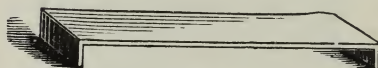


FIG. 6.

Washing or Cleansing Trough.—This consists of a framework like that of a table (see Fig. 4), the top being formed of a number of pieces of wood, placed equidistant from each other. A trough is placed underneath to receive the waste washings.

A Hot Plate, or, in default of such, a wire grating, mounted over a gas or petroleum-burner.

Porcelain Dishes, as used by photographers (Fig. 5).

Small Hand-rest, which consists of a thin piece of wood mounted at both ends on smaller pieces, as shown in Fig. 6.

A piece of Lime-tree Wood, of large folio size, which has been truly planed.

A Brush for washing the plate with turpentine.

A Brush for cleaning the plate with potash.

An Oil-stone.

Saucers for Lithographic Ink.

Drawing-pens.

Two Needles for re-touching the drawings, one having a blunt and the other a sharp point (Fig. 7).

A Fret-saw with a supply of saw-blades.

Rollers.—Two leather lithographic rollers, to be



FIG. 7.

respectively marked I. and II. ; a glazed leather roller, to be marked III. ; and a cloth-covered

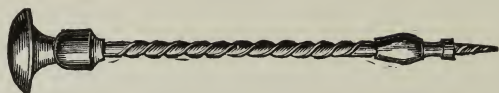


FIG. 8.

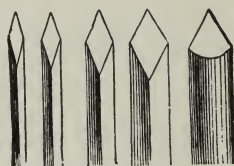


FIG. 9.

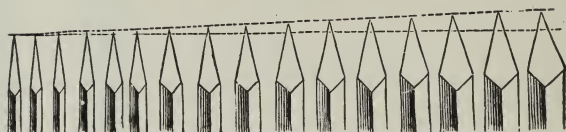


FIG. 10.

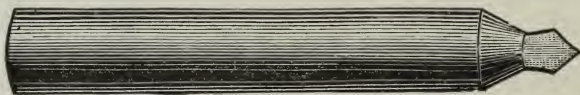


FIG. 11.

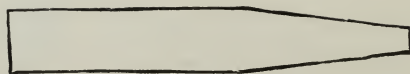


FIG. 12.

roller and a velvet-covered roller, to be respectively distinguished as IV. and V.

A quantity of Blotting-paper and fine white printing-paper.

A number of Sable Brushes

Several Sponges.



FIG. 13.

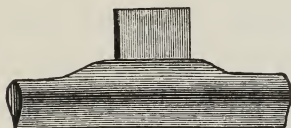


FIG. 14.

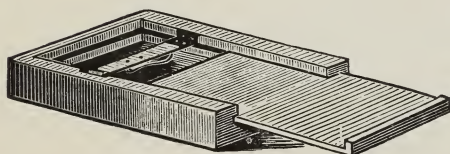


FIG. 15.

A Set of Tools, comprising the following :—A large half-round and a large oval file ; and a half-round and an oval smoothing file ; an awl ; a brush made of badger's hair ; a drill-stock, as shown in Fig. 8, with a number of good drills ; a number of engraving-

tools of varying degrees of strength, as in Fig. 9 ; a number of fine tint-tools (Fig. 10) ; an iron hammer ; a scraper with broad point, as shown in Fig. 11 ; a pair of scissors ; chisels ; magnifying-glass with handle ; a counter-sunk punch, as shown in Fig. 12, for driving in the pins in mounting the plate ; a tool for dividing the plates, as seen in Fig. 13.

In a large business, it is advisable to employ a band-saw for dividing the plates, and a scraper for levelling the rough zinc-plates. The form of scraper shown in Fig. 14 is employed with advantage, and is used by Gillot, of Paris.

For photo-zincography, a copying-frame is necessary, such as is represented in Fig. 15.

CHAPTER II.

MATERIALS.

THE following is a list of the necessary materials, which should all be ready to hand.

Lithographic Transfer Paper of different thicknesses.

Lithographic Chalk and Drawing Ink, both of which can be readily obtained at dealers.

Resisting Inks.—*Hard* consists of 1 part beeswax well mixed with 10 parts of finest printing-ink. *Soft* consists of 1 part beeswax, 1 part white pitch, and 2 parts good printing-ink. *Very soft* consists of 100 parts of the *hard ink*, 3 parts strong lithographic varnish, and 10 parts spirit of turpentine.

Gum Arabic Solution, 8 oz. being dissolved in 1 quart of water. Ordinary brown gum is used for the purpose.

Resin Powder, common colophony. One hundred

parts are thoroughly mixed with 5 parts beeswax. When the mixture has cooled, it is ground to powder.

Enamelled or Cryolite Paper.

Resisting ink for photo reproductions consists of 10 parts hard ink, 5 parts medium lithographic varnish, and 1 part palm-oil. When required for use it is, by the admixture of oil of turpentine, brought to the consistency of a good fluid glue.

Sensitised Composition and Paper. — Ten parts of fine gelatine* and 1 part bichromate of ammonia are placed in 40 parts of distilled water. The whole is then placed in a glass beaker, and put aside. When the salt is fully dissolved, and the gelatine is saturated with water, the glass vessel is inserted in a pot filled with hot water. As soon as the whole becomes a thin fluid, the glass vessel is taken out of the water, and the mixture filtered through a closely-woven fabric, and is next applied to the paper at a heat of from 66° to 77° F. Well-rolled and sized letter-paper is best adapted for the purpose.

* The author seems to refer to a gelatine similar to Nelson's No. 1 Photo-Gelatine.

A Solution of Potash.—Ten parts of pearlash, or salts of tartar being dissolved in 100 parts of water.

Retouching Ink, which is formed of soft resisting ink diluted with turpentine.

Nitric Acid, kept in a bottle, having a well-fitting glass stopper.

Shellac Varnish, formed of ordinary orange shellac; 6 to 8 parts being dissolved in 100 parts of methylated spirits of wine.

Spirits of Turpentine, as ordinarily obtainable in commerce.

Turpentine Ink for the production of ground or tone-plates. It is made by dissolving a piece of asphaltum of about the size of a pigeon-egg in one-fourth of a pint of spirit of turpentine.

Zinc Plates can be obtained ready polished. They should be nearly an eighth of an inch thick. Certain pictures can be etched upon ordinary sheet-zinc. Care must be taken that the metal employed is as free from lead as possible.

CHAPTER III.

THE PREPARATION OF DRAWINGS.

THE following instructions embody the life-long experiences of many of the leading Continental firms who have acquired a reputation in connexion with the production of zinco-typographic work.

The lithographic or chemical ink should be rubbed dry upon a clean porcelain saucer until a sufficient quantity adheres to it. Pure water should then be added by drops, and the whole mixed with the finger until it assumes a nearly black colour. It is not necessary to mix ink fresh for each drawing; but care must be taken that it remains free from dust. It is also essential that the ink should flow readily from the pen or brush, without, however, being watery. Under no circumstances must pale and black ink be used together for different effects in the same drawing, with the object of their being

reproduced as such, since in the reproduction only black lines and white interspaces are seen upon the paper, pale and deep-coloured lines appearing both equally black in the subsequent printing. When ink that has been once mixed becomes dry, it had better be thrown away, since it will not properly dissolve a second time. The genuine Gillot pens are best adapted for drawing with, by reason of their producing the finest and sharpest lines. The autographic transfer paper, which is used in the place of lithographic stone, should be treated just the same as the latter is ordinarily done. For the tracing of the drawing, tissue-paper is employed, which has been previously rubbed over with red chalk; fatty coloured paper must not be used for the purpose. This tracing is the work of the draughtsman. A slight sketching direct upon the paper with a pencil is also permissible. The prepared adhesive side of the transfer-paper is that upon which the drawing is made, and blotting-paper is employed for the purpose of protecting the drawing surface from finger-marks, which, although scarcely visible upon the paper, become conspicuous when transferred, in

the form of black patches, and may thus prove the means of making the drawing altogether useless. The drawing can be best done if the paper is mounted upon a sheet of plate-glass, to which it can be fixed at the edges by means of mouth-glue or gum. Care must be taken to make the drawing as free from errors as possible, since it is very difficult to subsequently make any corrections; all that can be done is to erase wrong lines; but to re-draw over the erased part is altogether impossible.* Should such re-drawing, however, be necessary, the faulty portion must be cut out of the paper, and a fresh piece inserted from the back, and fixed with mouth-glue, *not* gum.

What has been said above applies equally to drawing upon grained paper, the drawing being done with the proper crayons. These crayons, as well as the lithographic chalk used upon stone, should be cut from the point backwards. The

* The author is not quite correct in this statement, for errors may be rectified by removing the part with benzole or with india-rubber, the latter being used to remove what is left by the benzole. Small corrections may be done by the aid of india-rubber alone.

procedure with chalk drawings is as follows:—After the tracing, the drawing is outlined with chalk, and the respective tones or shades are then laid in. There must, however, be no stumping; but the tones or gradations should be drawn as clean as the chalk and the grain of the granulated paper permit. The drawing is then finished off with lines. It is possible to combine upon grained paper the chalk with the ink manner; but, in such a case, the drawing must be first carried out in chalk, and be then finished in lithographic ink. There must be no subsequent re-touching of the drawing with chalk, as otherwise the lines drawn with ink will become smeared, which, although it might be hardly discernible upon the paper, would, after transferring, appear upon the plate in the form of black specks.

CHAPTER IV.

DRAWING UPON HALF-TONE PAPER.

THE half-tone paper patented and manufactured by Herren Angerer & Göschl, of Vienna, is specially adapted for drawings which, in the form of illustrations, are to have a rich and vigorous effect. This paper is coated with a layer of white pigment, on which a ground has been printed in black in the form of points or lines in one direction, while these are crossed by indented lines which have no ink upon them; and this ground serves thus as a middle tone for the drawing. Lead-pencil, chalk, Indian or other black ink, may be indifferently employed; and by scraping with a smooth or toothed scraping-knife the most varied effects can be obtained. Tissue-paper, coated with red chalk or some blue pigment, is used, the latter

being preferable for tracing. Slight sketching with lead-pencil is also permissible upon such a ground-paper. The tracing must not be applied too strongly, so that any such lines of tracing, showing in the drawing, may have no disturbing effect in the reproduction. The drawing having been traced is next laid in with pen or brush, a brush of sable hair being employed for the outline and for the filling-in of surfaces, while the intervening portions are worked out with chalk or soft lead-pencil. The lighter tones are finally produced by scraping, and the highest lights taken out altogether, or covered over with a white pigment, such as Chinese white. For pen-and-ink drawings black Indian ink is employed, and for brush-work a black printer's ink which is neither too thin nor too thick. Take a small round porcelain saucer, and place it in a slanting position; a small quantity of printing-ink is put in the upper portion, while in the lower are placed a few drops of rectified turpentine mixed with benzine. The point of the brush is dipped into these, while the middle portion of the saucer answers the purpose of a palette. The transition from black to the

middle tones is effected by the aid of lithographic chalk or soft black-lead ; French Conté crayons are not adapted to the purpose. The light-effects are secured in the most diversified manner by scraping. The scraper should be held so that the handle comes between the third and fourth finger, or between the fourth and fifth, according as it is intended to scrape broad surfaces or only outlines. The thumb is placed against the side of the scraper as nearly as possible towards the point, in order to prevent springing. The fore and middle finger will press the instrument against the thumb. The scraping-knife should not be placed perpendicularly upon the paper, but the edge should be held in advance, towards one's body. When in this position, the scraper cuts into the composition like a plane-iron. If held in a different position, the scraper will not remove the surfaces cleanly, in addition to which the tool becomes blunt too soon.

Fine Turkey oilstones are best adapted for sharpening the scraper, care being taken that the tool retains its original shape ; and with that object it should always be placed upon its side while being

ground. As regards the toothed scraper, its ribbed edge should, of course, not be ground.

By going over the lines with the flat scraper, they become converted into points; and, by further scraping, these latter may be made to disappear altogether, affording thus a means of transition into the highest lights. Again, if a blackened portion of the surface is treated with a flat scraper, a fresh tint of lines is made to appear in a different direction to those which were printed on the paper; and in many cases this is a considerable advantage. By the aid of the toothed scraping-knife any desired lines can be produced arbitrarily. The artist's own judgment will have to decide as to where and how these tools are to be employed. If it is desired to utilise the previously-printed ground for only a portion of the drawing or sketch, the respective parts may be covered over with white or a different ground-paper, either of which can be fastened to the edge with mouth-glue. To cover it all over with paste or gum is inadvisable, by reason of the attendant risk of the paper becoming puckered for photographing. It must be borne in mind that these half-tone papers must not be rolled.

It is to be observed that photographic reproduction is generally preferred to transfer-work for maps, writings, plans, artistically-executed drawings; the advantage being that they can be first drawn with ordinary Indian ink, over which one may work with crayon. The original drawing can be made on a larger scale; besides which, the original is preserved intact.

The drawing must always be arranged for the intended reduction; *i.e.*, it must be not only correspondingly larger, but also proportionately stronger in its lines and tones, so that the fine details shall not be sacrificed in the reduction. The coarser a drawing is, the more it may be reduced; more delicate ones should not, however, be reduced too much. It must also be borne in mind that in letterpress printing it is impossible to reproduce washed tones or pale lines, as is the case in connexion with collographic printing. The only drawings suitable for the purpose in question are those which have positive black lines or points upon a white ground. The draughtsman should, therefore, work somewhat after the manner seen in wood-engravings, and as practised by lithographers.

White drawing-paper should be used for pen-and-ink drawings, and grained paper for chalk drawings. A little Roman sepia should be added to the Indian ink, since a brownish colour is most suitable for photographic reproduction. Any wrong lines that have been drawn can be covered over with white, or be effaced with washing; lights are put in with Chinese white. Charcoal drawings should be "fixed" as soon as completed; *i.e.*, "fixative" (a solution of white shellac in spirit) is blown over the drawing with a spray apparatus, until the whole picture is uniformly impregnated with the solution. Pencil drawings are only suitable for reproduction in connexion with letterpress printing, when drawn vigorously on grained paper with not too hard a pencil, and without stumping or softening.

When drawings are enclosed in letters or rolled up, they should be protected with tissue-paper against the possibility of any portion of the work being rubbed out; writing-paper should never be used for the purpose, as it is sure to smear the drawing. For transmission by post or otherwise, drawings should be placed between cardboard.

CHAPTER V.

PHOTO-ZINCOGRAPHY.

IF the operator should not have a photographic apparatus, it will be necessary to employ a photographer to produce the glass negative.

Development of the Print.—In a dark room the glass negative is inserted in the copying-frame, the collodion film being upwards. A dried sheet of the bichromated gelatine paper is placed over it; a few sheets of paper are laid on the top of all, and the copying-frame is then closed in order to proceed with the exposure to light of the print. On a sunny day from ten to fifteen minutes will suffice for that purpose, while on a cloudy day from half an hour to one hour, or even longer, will be necessary. When the edges of the sensitive paper not covered by the negative have assumed a brown colour, it may

be regarded as a sign that the exposure has been sufficiently prolonged. The copying-frame is next opened in the dark room, and the picture taken out.

For delicate drawings, a well-polished zinc plate is covered with an even layer of the ink described on page 16. The exposed picture is laid upon the plate that has been coated as above, and the whole is then inserted between two glazed boards, and passed through the transfer-press until the drawing has uniformly taken up the ink. Those portions that are too slightly covered with ink have to be re-touched, and after this has been done the drawing is put in lukewarm water. After having remained there for from twenty to twenty-five minutes, it is taken out, and lukewarm water poured over it, until the superfluous ink has been washed off, it being essential that the picture shall be perfectly clean. The picture is next floated for one hour on cold spring water, with the object of freeing the paper from the superfluous bichromate of ammonia. A soft-hair brush or a small soft cotton pad may be used for spreading the ink upon drawings with bold lines. After they have been inked-in,

the picture must be exposed to the air for from twenty to thirty minutes, to enable the oil of turpentine to evaporate which has been used for thinning the ink. If a photographic *atelier* is at hand, where the "Lichtdruck" process is carried on, it is advisable, for simplicity's sake, to have an impression taken upon Indian re-transfer paper from a "Lichtdruck" (collographic) plate, since such an impression can be faultlessly transferred.

A different process for the production of black ground printing-plates, is as follows :—Albumenised paper is coated on its prepared side with bichromate of potash which has been dissolved to saturation in the white of eggs. This coating should be applied in a dark room, where the paper thus prepared is also allowed to dry. It may be explained that the white of eggs is beaten up to a froth, after which it is allowed to stand, and is then saturated with bichromate of potash, the solution being applied to the paper with a small soft sponge. In three or four days sensitised paper is thus obtained. The matter to be transformed is next put in the press, carefully made ready, and several impressions are

then taken from the forme upon prepared paper in black or red ink.* This should, if possible, be done by lamplight, each impression being, as soon as taken, inserted in a book held ready for the purpose. If it is desired to give a ground-work to the plate, some fine lace pattern or crape should be laid upon the copying glass of the copying-frame; the printed paper is then laid upon it, with the side bearing the picture downwards, after this the copying-frame is closed, and exposed to the daylight. When the yellow colour has become brown by the action of the light, it may be taken as an indication that the exposure has been sufficiently prolonged. The process of inking-in, that follows next, is the same as already described. All those parts that were acted upon by the light will appear black, while those parts that were protected from the direct light by the ink, or by threads, lines, &c., will appear white, so that the original white ground has by this simple process been converted into a negative black one. The damp negative so produced is now placed between some

* See "Grammar of Lithography," p. 123, published by Messrs. Wyman & Sons.

sheets of blotting-paper, and after it has been dried the re-touching is proceeded with. This may consist in weakening the ground which will possibly appear too light, or in adding ornament to the lettering, inserting initials, or surrounding the whole with a border. When all this has been done, the transposed work is ready for transfer on the zinc plate, and for etching.

CHAPTER VI.

HALF-TONE RELIEF BLOCKS.

THE first experiments in connexion with this process date back several decades, and among those who have in recent times done good service in this connexion are Meisenbach and an American named Ives. In Germany Professor Husnik has more especially occupied himself with the production of photographic relief plates for printing upon the steam press. In his "Heliography" (1878) he makes the following remarks on the subject:—When a solution of gelatine, mixed with a due proportion of any soluble double salt of chromic acid, is poured upon a level glass or metal plate placed in a horizontal position, and if the plate is then allowed to dry in the dark, and is afterwards exposed under a glass picture (negative or positive)

there will be developed upon the gelatine film a picture in brown upon a yellow ground, and by being steeped in cold or tepid water it will through unequal swelling be transformed into a relief. Those portions of the gelatine film which were under the transparent part of the glass picture, and were thus exposed to a stronger light, have to a greater or less extent lost their capacity of swelling in water, in a measure corresponding with the amount of light to which they have been exposed. On the other hand, those parts of the gelatine, that have been least acted upon by the light, *i.e.*, those that have been covered by the opaque parts of the plates, have retained their capability of swelling, and by the absorption of water they form raised portions, or, in other words, a relief picture. Either a smooth or a grained surface can be produced according to the kind of gelatine employed, or the various additions that have been made to the chrome-gelatine solution, and more especially according to the degree of temperature that prevailed during drying; and this relief, which according to circumstances can be produced higher or lower, may in a variety of ways, by

moulding or otherwise, be transformed into a metal printing-plate. If for the exposure to light a negative has been used, a high relief printing-plate is obtained; if, however, a positive has been employed for exposure, the result will be an intaglio plate in which the picture is sunken and the ground in relief.

According to Professor Husnik, the glass-plate is prepared in the following manner :—Take 6 parts finest gelatine, 60 parts soft water, 1 part bichromate of potash (or bichromate of ammonia), and $2\frac{1}{2}$ parts chloride of calcium. The gelatine is allowed to swell, and is then dissolved in a water-bath; after which, while being stirred, the other ingredients are added in the form of powder. Thick white filtering-paper is used for the purpose of filtration, which process has to be repeated two or three times. When the solution has been poured over the plate, the latter must lie in a perfectly horizontal position. The thickness of the coating should be at the rate of about 1 gr. solid gelatine to 1 square inch of the plate.

The drying of the plate is effected in a box at a

heat of from 86° to 104° F. The exposure of the dry plate requires from twenty to twenty-five minutes. The isolated plate is placed in a flat dish, in cold water, and is freed from the chrome-salt by the repeated addition of water. The grain that has been once developed does not disappear, even after the film has become perfectly dry. If the whole of the chrome-salt is not washed away from the coating, or if there be added to the water-bath some bichromate of potash, and the rinsed plate be allowed to dry, it is possible, by short exposure from the back, to so correct the plate that, during the subsequent swelling, all sunk parts will be in one plane, and, as a result, the letterpress printing-plate will have all picture portions in relief. It would take us too far to enter here into every detail of the process, and we must, therefore, refer the reader to such special works as deal with the subject.

In its leading outlines, the procedure in connexion with half-tone reliefs is as follows :—A negative upon glass is made from a white sheet of paper printed over with lines, or a network of points ; and this negative, is employed a second time for photograph-

ing the respective article or picture. While this twofold negative is copied upon zinc, there are formed, during the etching of the zinc, the gradations consisting of either lines or points. The same result can also be obtained if two distinct negatives are made, one having the network and the other the respective article. For the purpose of being copied upon zinc, both negatives are then laid with the picture side one upon the other.

Mr. Ives's process is mainly as follows:—From a photographic negative he produces a gelatine relief;* this is coloured white, and is printed over with an elastic stamp, the surface of which is, in various directions, divided into fine lines, so that the latter shall cross each other. The sunk lines remain free from ink, while, on the other hand, the ink is fully taken up by those portions of the relief that are most raised, viz., by the shaded parts. There is, thus,

* For this purpose a thick film of sensitised soft gelatine is used. After exposure under a negative, it is washed with warm water (being previously transferred from its original support to another surface) to remove the unacted-upon gelatine. After drying, there remains a picture in relief—which is precisely analogous to that employed in the Woodburytype printing process.

produced upon a white ground a picture formed of black lines and points. From this is taken a photographic negative, which is utilised in the ordinary way for the production of a metal *cliché*.

According to Meisenbach's process, instead of making a relief after the negative has been taken, he produces a diapositive, and he then makes a negative in the well-known manner. During the exposure he inserts a second negative, which has lines upon it, in front of the diapositive. If the exposure is then interrupted, and at the same time a different position given to the line-negative, so as to bring it in a direction diverging from what it was originally, the second negative obtained in the camera will show crossings of the lines. It will thus be seen that in this process the line-negative replaces the elastic stamp employed by Ives.

Herr C. Angerer holds that the negative through which is effected the so-called disintegration of the grain, should likewise be taken from a plastic object, and not from a plane surface, in order that fewer details may be lost. He employs for this purpose a white silk net, which is placed at some distance in

front of a wall hung with black velvet, and allows this to operate through the camera in different directions upon the sensitive plate. This negative is then employed, as above, either in the production of negatives from diapositives, or similarly for the direct taking of the negative from any desired original, such as drawings in Indian ink, photographs, plastic objects, &c. In the former case it is inserted before the diapositive, in the latter before the sensitised plate. The firm of C. Angerer & Göschl, of Vienna, who have done much towards the perfection of this process, have during recent times attained truly astonishing results in this connexion.

CHAPTER VII.

CHROMATIC BLOCK-PRINTING.

THIS branch of zinc etching, which has been cultivated during the last few years, and has been brought within the province of letterpress printing, has already produced the most satisfactory results.

The process is applicable to all cases in which it is desired to produce a coloured reproduction, and is qualified to compete with the art of lithography. The author himself has seen pictures thus produced in eight and even in sixteen colours.

The drawings for such plates are produced upon stone in the lithographic press. If the colours answer and harmonise properly, a transfer upon the zinc plate is taken from each stone, and the etching is then proceeded with. Expansion or contraction, to

the extent experienced in connexion with woodcuts, is impossible.

Where a large edition has to be printed the cost of production will be lower than if produced by lithography.

CHAPTER VIII.

TRANSFER OF DRAWINGS.

BEFORE a drawing is transferred upon zinc, the latter must be thoroughly cleaned. For this purpose the plate is laid upon a sheet of paper, and the polished surface covered with a uniform layer of Spanish white or whiting. It is next rubbed over with a rag crosswise (*not* with a circular motion), and is then well cleaned. When wholly freed from grease, the surface is slightly roughened; this can be done by inserting the zinc plate in a bath consisting of two per cent. of acid; the box is then rocked, so that the acid shall uniformly attack the whole, after which the plate is rapidly withdrawn and by being rinsed with pure spring water, all risk of oxidation is guarded against. The plate should next be warmed, in order to get rid of every trace of moisture. The roughening of the surface before referred to can be

also effected by rubbing with powdered pumice-stone moistened with water. The roughened plate must be stowed away until required for use, in a place kept quite free from dust.

A drawing which has been prepared upon autographic or chalk paper must, first of all, be freed from the blank paper, and then laid upon a sheet of white paper of the same size as the zinc plate to be employed, and it should then be pricked by the aid of two engraving-needles, the board of lime-tree wood, described under the head of "Plant," being laid underneath. The drawing is held with a blunt engraving-needle, while the corners of the drawing are pricked with a sharp-pointed needle, which must be held perpendicularly. When this has been done, it is well to see to it that all edges firmly adhere. This being all right, the drawing is next inserted between damp sheets of blotting-paper, and is allowed to remain there until the drawing paper has absorbed sufficient moisture, which can be ascertained by the curling of the paper. For drawings freshly made five minutes will suffice, while other drawings will require a longer interval.

The following process applies equally to all pictures without distinction, whether photographs or illustrations which are to be transferred from stone or plate, or whether drawings carried out upon paper in line or chalk. The prepared drawing is laid upon a well-cleaned zinc plate which is held in readiness; a few sheets of smooth paper are placed over it, which are in turn inserted between two glazed boards, and the whole is then passed between the rollers of the transfer-press, the necessary pressure of which has been previously adjusted. The plate is passed two or three times through the press, and it is well to ascertain, after its first passage, whether the drawing adheres properly to the plate. The drawing should be slightly damped with a sponge each time it is examined, with a view of ascertaining whether it has become transparent; and the passing through the press should be continued until the drawing appears quite flat, and all traces of air-bubbles between the drawing-paper and the plate have disappeared. As soon as this has been attained, the plate, with the drawing upon it, is immersed in a vessel filled with water, and after

a few seconds the paper is detached. In detaching the drawing-paper, the film of composition of the latter will be found to still adhere to the plate, and it has to be removed carefully with a sponge. The plate is, after this, freed with a sponge from all superfluous moisture, and is finally gummed uniformly with a broad brush.

CHAPTER IX.

SHARP- AND CLEAN-ETCHING.

EVERY plate that has already a drawing upon it is subjected to the following treatment :— Upon a leather roller distinguished by the numeral “I.” (as mentioned in the chapter on “Plant”), there is spread evenly, with the aid of a spatula, as much of the hard ink as the point of a knife will hold ; this is next well distributed upon a smooth stone, and after this the inking-in of the plate is proceeded with. Before, however, actually commencing this, the plate has to be once more uniformly coated with gum. During the inking-in the plate has to be laid upon a level table or stone, in order that the drawing may uniformly take the ink in all its parts. The roller, too, must be lightly passed over the plate to and fro, *without any pressure* ; and after each passage the roller should be turned, so that the same

part of it shall not pass successively over any one part of the plate. Should a slight film of ink have formed upon the plate, it must be washed off with a damp sponge, the plate freshly gummed, and once more inked-in, until it is covered with an opaque layer of ink. After this the plate is washed, gummed, and, as already described, the inking-in of the drawing is repeated two or three times. The moisture absorbed by the roller during the inking-in is again removed by renewed rolling upon the inking-stone.

After the plate has been duly covered with the ink, it is dried in the air, and when thoroughly dry dusted with powdered resin. A fine badger-hair brush is used for this dusting, and, by passing this over gently in all directions, the powdered resin becomes incorporated with the ink. Any particles of the powder that may adhere to the bright metal must be rinsed off with water, and the plate immersed immediately in an acid bath of three per cent. After the etching-box has been rocked from fifteen to twenty times, the plate is taken out, rinsed again in clean water, so as to prevent all risk of oxidation,

and the plate, which will then be quite free from acid, is next placed upon the hot-plate, its edge resting upon a piece of wood, and the face of the plate leaning against the wall. In establishments where no hearth is available, a substitute is found in wire grating, underneath which is fixed either a petroleum lamp or a gas-burner, as mentioned in an earlier chapter.

When the plate is quite dry, it is laid with its back upon the hearth or upon the wire grating, and is exposed to heat until the drawing assumes a gloss. As soon as this takes place, the plate is laid upon the table to cool, after which the back is covered with shellac varnish, and when this has set the large blank portions on the front, *i.e.*, those on which there appears no drawing, are similarly coated. The object of so applying the shellac varnish is to protect the parts thus covered against the action of the acid, and the covering of the large blank spaces on the front has the further advantage, that the acid has not to eat away useless metal. The varnish having dried, the drawing is next re-touched with the aid of a fine artist's brush or a soft pen and well-ground chemical

ink or re-touching ink, as mentioned under the head of "Materials." After the re-touching has been completed, the plate is once more warmed, in order that whatever corrections have been made may be more completely united with the metal; and when the plate has again been cooled the proper *first* sharp-etching commences.

The plate is immersed in the acid bath, and the blank metal is allowed to be eaten away to the extent of an ordinary sheet of thick plate paper. In drawings having fine lines, and especially in grain and chalk drawings, the amount of metal eaten away must not exceed the thickness of thin plate paper. After the plate has been removed from the acid bath, well rinsed with water, and allowed to dry on the warm hearth, it is heated to such a degree as to make the ink run off from the sides of the several lines and points, in order to resist the action of the acid. The object of the repeated etching will be obvious from the following :—In plates for letterpress printing the lines and points of the drawing, however fine they may be, should run diagonally upwards from both sides, thus Λ , so that by continuous printing at the

steam-press the lines may not break away. This base of lines and points is secured, in chemigraphic manipulation, by having the plate sharp-etched from six to eight times, and by having the drawing well supplied each time with resisting ink. The steps caused by this repeated sharp-etching are in turn removed by the succeeding after- or clean-etching.

The sharp-etchings that follow are identical with the first in their fundamental principles, excepting only some slight variations. Thus, for instance, for the second etching the leather roller marked "II." and soft ink are employed (both these items are more fully described in an earlier chapter). Prior to the etching, an opening is made with the scraping-needle in the shellac coating on the front side of the plate, so that, after the etching has been completed, one may be able to observe the action of the acid. For the third etching a cloth roller is employed, and thin ink, while the acid bath is at the same time made stronger. If still further sharp-etchings are required, a velvet roller should be used and thin ink.

The reason for employing, in turn, cloth and velvet

rollers, as above described, is that such soft rollers enter more deeply into the drawing as the progress of the biting demands.

After the last of the sharp-etchings has been completed, the plate is heated upon the hot-plate until the ink altogether dissolves. The hot zinc plate is then carried to the washing-trough mentioned in the chapter devoted to a description of the necessary plant; oil of turpentine is poured over the plate, and rubbed off again with a soft brush. With a second brush, which has been dipped in a potash solution, all traces of ink and turpentine are washed away, and the plate is then finally rinsed in fresh spring water.

The after-etchings can be proceeded with as soon as the plate has been freed from all moisture by heat. Very thin ink is well distributed over a glazed leather roller. The plate is then heated, in order that the drawing may take the ink more easily and uniformly; and the inking-in is continued until a rough layer of ink appears upon the drawing. The plate is now again warmed, for the purpose of effecting the thorough combination of the various

particles of ink, so that every part of the drawing may be protected against the action of the acid. When cool, the drawing is again inked-in, then re-touched, dusted with powdered resin, and heated until a glaze is formed, after which the plate is put on one side to become quite cool. As soon as this is the case, a small portion is once more scraped to form an open spot, as before explained, and the plate is then immersed in a fresh five per cent. acid bath, and the blank metal etched away to the thickness of a sheet of thin note-paper. When the plate has been removed from the acid bath, it is again rinsed in clean water, heated, and cleaned once more with turpentine and potash. This done, the plate is put on one side to become quite dry.

The second and the third operation of clean-etching only differs from the foregoing in that no powdered resin is employed; while, moreover, in the third after-etching only a three per cent. acid solution is used.

CHAPTER X.

THE MOUNTING OF THE PLATES.

THE cutting-away of the waste metal that appears in the interstices of the drawing is best done by the aid of a chisel, or, where the surfaces to be removed are large, by the aid of a fret-saw. A routing-machine can also be employed with advantage for the purpose. The plate having been freed from superfluous zinc, and the necessary holes for the pins drilled in suitable places, it is ready for mounting. Maple-tree is a suitable wood for the purpose, and nails or pins $\frac{3}{8}$ inch long, with broad heads, are specially adapted for securing the edges of the metal to the wood, while for the middle portions smaller pins may be employed.

CHAPTER XI.

THE PRINTING.

THE printing of zinco-typographs on the steam-press requires the same amount of attention and technical proficiency as do wood-cuts. The durability of zinc *clichés* is far greater than that of wood-cuts. It has been proved that with the prolonged use of such a *cliché* the picture decidedly improves, since in the course of printing it loses the roughness of the metal by which it is characterised at first.

CHAPTER XII.

PROTECTION AGAINST OXIDATION.

A BRUSHING-OVER with tallow answers, in most cases, as a protection from oxidation, but a still more permanent protection of the zinc is afforded by the following process :—The plate is first cleaned with oil of turpentine next with a potash solution, and is then rinsed in clean water. After this, it is rapidly dried on a hot hearth, and, while still warm, the drawing is inked-in with thick resisting ink. When again required for use, all that is necessary is to wash the plate with spirit of turpentine.

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
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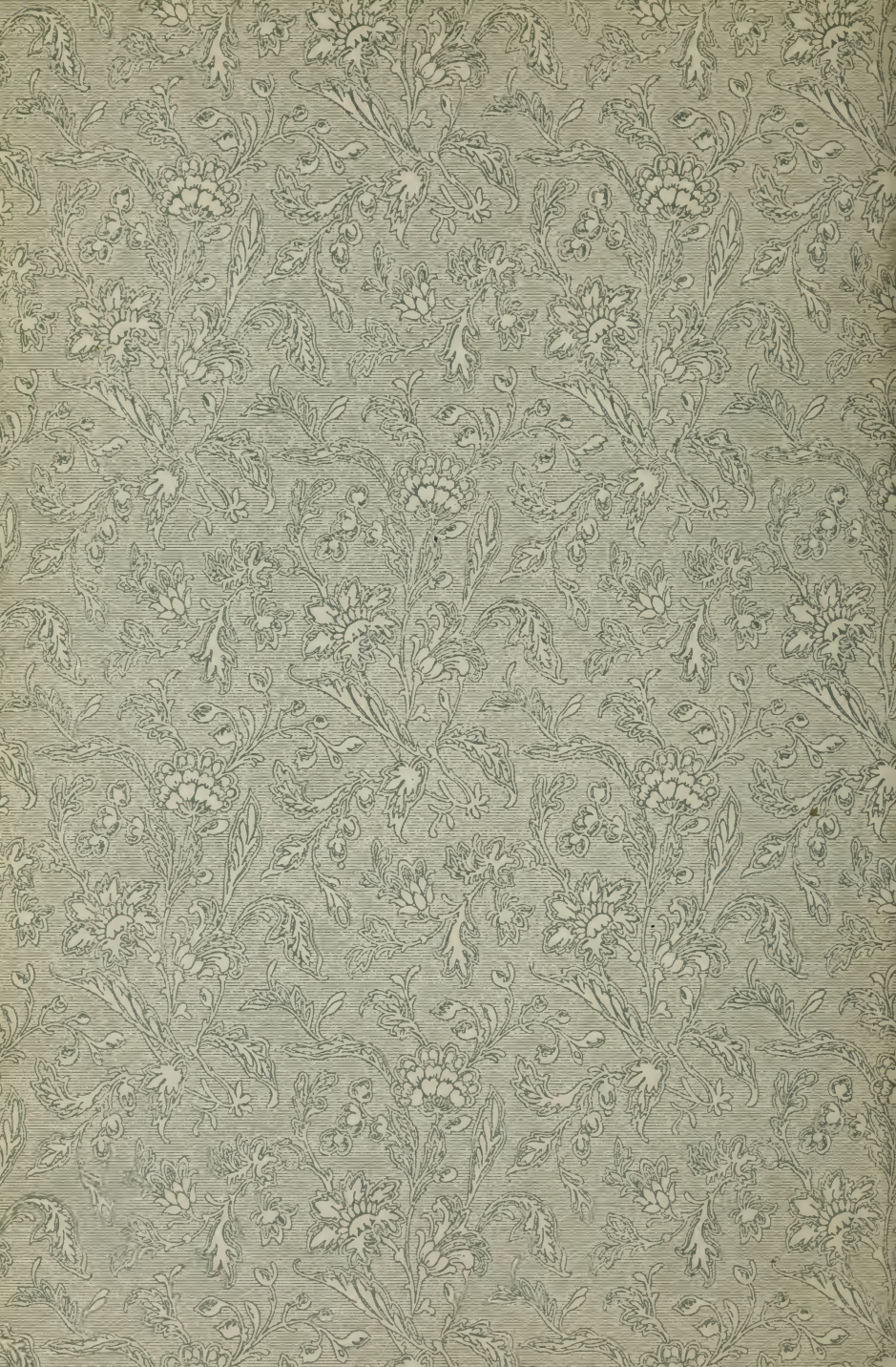
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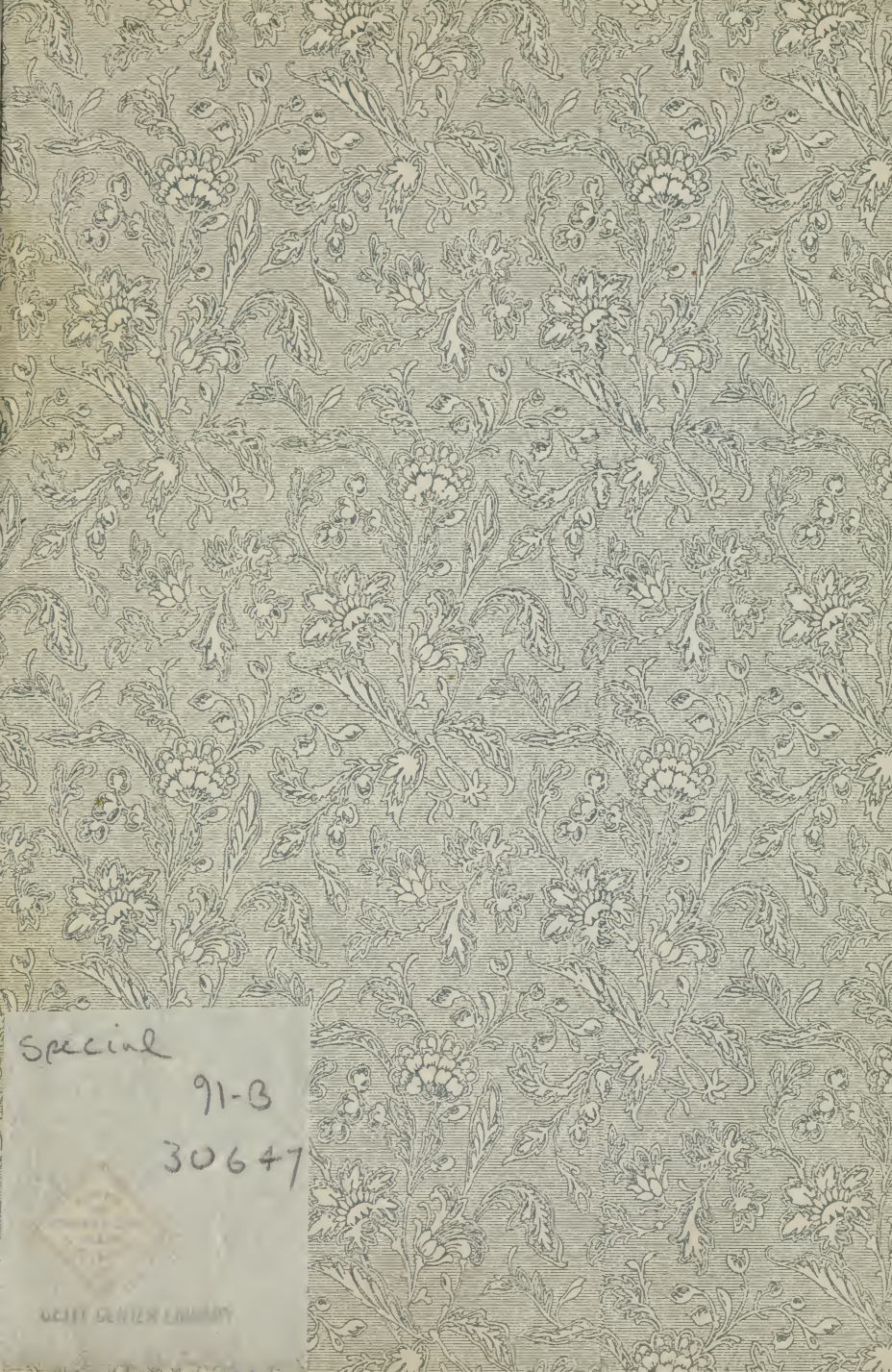
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